[Amended pages]

Specification

PATIENT POSITIONING DEVICE FOR A COMPUTER TOMOGRAPH

The invention relates to a patient positioning device for a computer tomograph device and to a computer tomograph device having a patient positioning device of this kind.

A computer tomograph device, or CT device for short, serves to make three-dimensional images or images of slices of a body. The image data are computed by a computer using two-dimensional X-ray projections of the body. For recording the two-dimensional raw image data, an X-ray beam source and an image detector diametrically opposite one another rotate around the body. The rotation takes place inside a so-called gantry, which has an examination opening into which the body can be introduced.

The position of the body in the gantry and the stability of its position there are decisive for the image quality. A patient positioning device must therefore assure sufficiently stable support of the patient's body and should not have any significant sagging, for instance, in response to the patient's weight. At the same time, though, a complicated construction for supporting the patient's body in the examination opening of the gantry cannot be used, because it would create interfering artifacts in the image there.

On the other hand, a patient positioning device should be adjustable flexibly enough that handling the patient when shifting him onto the patient positioning device and providing medical care of a patient already lying on it is made simpler. For example, it may be

desirable for the patient positioning device to be able to be lowered so the patient can lie down on it and raised so the patient can get up from it.

Last but not least, good accessibility for medical staff is advantageous, and for that reason the space below the patient positioning device should as much as possible be free and without intervening constructions.

From German patent disclosure DE 101 08 549, a patient positioning device is known that enables flexible positioning and assures a stable position of the patient's body in the examination opening of the gantry of a CT device. However, it offers no possibility of height adjustment, and below the patient lying on it, it has a bulky construction, which makes accessibility more difficult.

From US Patent 6,637,056, a patient positioning device is known which makes a combined horizontal and vertical motion possible. It can be lowered into a position placed on the floor, in order to reduce the total height and thus make it easier to place a patient on it. However, the bulky lifting device underneath the patient bed makes accessibility to the patient more difficult.

The object of the invention is to disclose a patient positioning device for a computer tomograph device which assures a stable position of the patient's body in the examination opening of the gantry, is simultaneously flexibly adjustable in position, and has good accessibility to medical staff. A further object of the invention is to disclose a computer tomograph device having a patient positioning device of this kind.

This object is attained by a patient positioning

device having the characteristics of the independent claim and by a computer tomograph device having the characteristics of claim 4.

A fundamental concept of the invention is to disclose a patient positioning device for a computer tomograph device, which device includes a gantry supported on a base; the patient positioning device includes a bed guide for a patient bed and has an arm which is supported in the vicinity of its head end or foot end, in particular on or at the base, by a rotating joint that is rotatable about a horizontal axis that is perpendicular to the length of the patient positioning device, and the bed guide is supported on the arm by a rotating joint which is rotatable about a horizontal axis that is perpendicular to the length of the patient positioning device, and the height of the bed guide is adjustable by motion of the arm about the rotating joint in which the arm is supported, and the arm is embodied such that the rotating joint, when the bed guide is partly or completely lowered, is not located underneath the bed guide.

Because of the support of the bed guide on an arm in the vicinity of its head end or foot end, which when the bed guide is partly or completely lowered is not located underneath the bed guide, a construction is obtained in which the space below the bed guide remains free. This assures good accessibility to the patient. The term bed guide should be understood in this context to mean a structural element that makes it possible to attach a patient bed. The bed guide may have the capability of being solidly connected to a patient bed, or it may be embodied as a rail-like guide that allows the patient bed to be placed on it or inserted and that guides the patient bed displaceably in the longitudinal direction.

The motion of the patient bed that results from the rotatable mounting of the arm in the vicinity of its head end or foot end has the further advantage that the patient bed, on being lowered so a patient can be placed on it, is simultaneously moved away for instance from a gantry of a CT device, in which the patient bed can be supported. Because of the greater distance from the gantry, the accessibility of the patient bed is improved, and furthermore there is less interference with any operation of the gantry that may be taking place at the same time. Thus a CT examination can for instance proceed unimpeded while another patient is being placed on the lowered patient bed.

While being raised, the bed guide is also simultaneously moved closer to the gantry, which is an improvement in terms of wear and tear on the patient bed and thus on the patient's body in the examination area. For instance, the leverage with which the patient's weight is supported relative to the bed guide and which causes sagging of the patient bed is reduced.

In an advantageous embodiment of the invention, the patient positioning device has a height adjuster, which is connected to the arm such that it can rotate the arm about the rotating joint by which the arm is supported in the vicinity of its head end or foot end. The height adjuster has a motor for this purpose, which adjusts the arm, for instance by means of a worm drive associated with the motor and a gear wheel on the arm. The motor may also drive hydraulic drive that drives the arm around the rotating joint. The height adjuster assures an automatic adjustment of the height of the patient bed and thus makes the work of the medical staff easier.

In a further advantageous embodiment, the patient

positioning device has a support arm, which is supported on the arm by a rotating joint that is rotatable about a horizontal axis, and on which support arm the bed guide is supported by a rotating joint that is rotatable about a horizontal axis, and its length is automatically adjustable such that the orientation of the bed guide remains stable, regardless of a rotation of the arm. This assures that a patient can be placed for instance on the horizontally oriented patient bed, and that this horizontal orientation is maintained when the height of the patient bed is adjusted.

Maintaining the orientation is on the one hand pleasant for the patient who is being moved automatically by the patient positioning device. On the other, it enables positioning the patient, with the patient bed lowered, in exactly the position in which for example an ensuing CT examination is to be done. Changes in the patient's position as the patient positioning device is moved to approach the gantry, which could cause movements on the part of the patient and hence interfering artifacts from that motion in the CT image data, are thus averted.

The automatic adjustment of the length of the support arm can be implemented by the same principle as the rotary motion of the arm. For instance, if the rotary motion is attained purely mechanically, such as by a worm drive and a gear wheel, then the length of the support arm can also be accomplished by means of a mechanical gear-wheel or lever system. If the rotary motion of the arm is conversely driven hydraulically, then the length of the support arm can also be adjusted hydraulically.

The hydraulic adjustment enables especially flexible movement of both the arm and the support arm, so that the height of the patient bed is adjustable via the arm, and

its orientation is adjustable via the support arm, freely and independently of one another. If the orientation of the bed guide is to be maintained while the arm is being adjusted, the longitudinal adjustment of the support arm must be adapted to the motion of the arm. To that end, the hydraulic drive can perform the longitudinal adjustment in accordance with a characteristic curve as a function of the adjustment of the arm. The characteristic curve depends on the geometric relationships among the arm, the support arm, and their rotating joints.

In a further advantageous embodiment of the invention, a computer tomograph device has one patient positioning device on each side of the through opening of the gantry. This makes it possible to perform CT examinations of a plurality of patients particularly smoothly and quickly.

That is, while one patient can be placed on the lowered patient bed on one side of the gantry, a patient located on the other patient positioning device can be examined in the CT device at the same time. Once the examination is concluded, the patient bed is lowered and thus moved away from the gantry. This makes the examination opening available for the immediate examination of the next patient, who is moved toward the examination opening by the approaching motion of the patient positioning device. The patient bed of the patient to be examined can then be introduced into the bed guide, which has meanwhile become available, of the patient positioning device on the opposite side. The CT examination of that patient then begins while the patient positioning device on the other side is lowered again for receiving the next patient.

Amended claims (April 26, 2005)

1. A patient positioning device for a computer tomograph device (1) supported on a base (5), the patient positioning device including a bed guide (7, 7') for a patient bed (9),

characterized in that it has an arm (11, 11'), which is supported in the vicinity of its head end or foot end, in particular on or at the base (5) by a rotating joint (17, 17') that is rotatable about a horizontal axis that is perpendicular to the length of the patient positioning device; that the bed guide (7, 7') is supported on the arm (11, 11') by a rotating joint (19, 19') that is rotatable about a horizontal axis that is perpendicular to the length of the patient positioning device; and that the height of the bed guide (7, 7') is adjustable by motion of the arm (11, 11') about the rotating joint (17, 17'), in which the arm (11, 11') is supported, and the arm (11, 11') is embodied such that the rotating joint (17, 17'), when the bed guide (7, 7') is partially or completely lowered, is not located underneath the bed guide (7, 7').

2. The patient positioning device as defined by claim 1,

characterized in that it has a height adjuster (15, 15'), which is connected to the arm (11, 11') such that it can rotate the arm about the rotating joint (17, 17') by which the arm (11, 11') is supported on or at the base (5).

3. The patient positioning device as defined by one of the foregoing claims,

characterized in that it has a support arm (13, 13'),

which is supported on the arm (11, 11') by a rotating joint (21, 21') that is rotatable about a horizontal axis, and on which support arm the bed guide (7, 7') is supported by a rotating joint (23, 23') that is rotatable about a horizontal axis, and its length is automatically adjustable such that the orientation of the bed guide (7, 7') remains stable, regardless of a rotation of the arm (11, 11').

4. A computer tomograph device (1), which is supported on a base (5) and includes a patient positioning device, the patient positioning device including a bed guide (7, 7') for a patient bed (9),

characterized in that the patient positioning device has an arm (11, 11'), which is supported in the vicinity of its head end or foot end on or at the base (5) by a rotating joint (17, 17') that is rotatable about a horizontal axis that is perpendicular to the length of the patient positioning device; that the bed guide (7, 7') is supported on the arm (11, 11') by a rotating joint (19, 19') that is rotatable about a horizontal axis that is perpendicular to the length of the patient positioning device; and that the height of the bed guide (7, 7') is adjustable by motion of the arm (11, 11') about the rotating joint (17, 17'), in which the arm (11, 11') is supported, and the arm (11, 11') is embodied such that the rotating joint (17, 17'), when the bed guide (7, 7') is partially or completely lowered, is not located underneath the bed guide (7, 7').

5. A computer tomograph device (1) as defined by claim 4, having a patient positioning device as defined by claim 2 or 3.

6. A computer tomograph device (1), which includes one patient positioning device on each side of the through

opening in a gantry (3) of the computer tomograph device (1).